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<110> Rice University
Stewart, Charles R.
Shamoo, A. Yousif

<120> Anti-Microbial Proteins from the SP01 Bacteriophage

<130> 61683-00004USPT

<150> 60/357780

<151> 2002-02-19

<160> 24

<170> PatentIn version 3.2

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Arg Leu Gly Glu Val Asp Val Gly Arg Val Ser Glu Val Ala Asn Asp
35 40 45

Gly Arg Leu Tyr Leu Asp Gly Pro Gly Val Ile Val Thr Leu Asp Gln
50 55 60

Pro Phe Ile Leu Leu Lys Glu Val Val Glu Glu Glu Glu Asp Glu Asp
65 70 75 80

Asp Arg Ile Asp Ala Glu Phe His Asn Asp Pro Leu Leu Arg Lys Leu
85 90 95

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Glu Asn Thr Thr Glu Lys Leu Thr Pro Glu Glu Thr Gln Leu Ala Gln
100 105 110

Trp Thr Thr Met Thr Arg Val Phe Ser His Asp Leu Lys Lys Gly Ile
115 120 125

Pro Tyr Ala Ile Lys His Lys Asn Ser Gly Asn Ile Leu Tyr Gly Leu
130 135 140

Tyr Ser Gly Leu Leu Asn Pro Val Thr Ala Leu Phe Arg His Leu Asn
145 150 155 160

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165 170 175

Ile Tyr Glu Val Val Glu Asp Glu Glu Glu Ser Ile Trp Asn
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Phe Met Asp Met Glu Leu Glu Gly Ala Thr Val Gln Glu Val Ala Arg
35 40 45

Ile Glu Gly Ser Glu Ile His Leu Arg Thr Pro Asn Gly Asn Glu Pro
50 55 60

Ser Tyr Arg Tyr Met Gly Gln Tyr Leu Ile Leu Lys Pro Tyr Gly Ser
65 70 75 80

Ser Asp Pro Arg Gly Asp Ile Leu Val His Glu Asp Val Gln Tyr Val
85 90 95

Arg Val Asp Ala Gln Ala Met Pro Gly Asp Leu Ile Glu Ala Leu Glu
100 105 110

Pro Asn Lys Leu Pro Phe Ser Gly Lys Arg Phe Lys Tyr Arg Pro Ala
115 120 125

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Val Leu Glu Val Glu Tyr Val Leu Thr Lys Asp Glu Gln Val Leu Gln
130 135 140

Leu Glu Asn Gly Lys Ser Tyr Ser Gly Ala Tyr Arg Val Leu Ile Pro
145 150 155 160

Arg Met Gly Val Leu Pro Pro Lys Thr His Ile Tyr Thr Thr His Lys
165 170 175

His Val Phe Met Glu Asp Val Phe Val Leu Gly Asn Ser Tyr Glu Leu
180 185 190

Ser Ser Pro Asn Asp Val Glu Met Thr Pro Ile His Ala Val Phe Thr
195 200 205

Gly Phe Ser Lys Asn Arg Asp Glu Ala Ile Phe Val Asn Pro Tyr Tyr
210 215 220

Asn Asp Asp Gly Val Thr Gly Thr Met Ile Thr Val Ser Asp Leu Leu
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Thr Gly Lys Trp Asp Ile Thr Pro Leu Val Pro Lys Lys Gly Val
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20 25 30

His Lys Val Val Lys Val Leu His Arg Phe Arg Asn Ile Thr Asp Leu
35 40 45

Gln Ile Thr Asn Trp Lys Gly Thr Glu Thr Arg Tyr Asn Leu His Val
50 55 60

Thr Glu Tyr Lys Val Leu Val Pro Tyr Asp Thr His Lys Glu Glu Asn
65 70 75 80

Glu Ala Met Ser Asp Ser Leu Ile Thr His Asn Gly Lys Asp Tyr Val
85 90 95

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Leu Cys Lys Ile Pro Ala Arg Val Gly Asp Leu Ile Arg Thr Glu Asp
100 105 110

Lys Arg Val Trp Glu Val Leu Gln Lys Ser Lys Asp Gly Leu Val Leu
115 120 125

Tyr Asn Glu Glu Lys Gly Glu Gln Arg Ser Ala Val Tyr Ser Glu Ile
130 135 140

Gly Pro Tyr His Val Leu Val Pro Arg Asp Thr Asp Thr His Thr Pro
145 150 155 160

Thr Arg Glu Glu Leu Ala Ala Val Ile Met Asn Lys Ala Phe Thr Arg
165 170 175

Thr Glu Thr Gln Asp Ser Gln Glu Asp Thr Gly Thr His Lys Gly Leu
180 185 190

Gly Leu Thr Gly Thr Asp Leu Tyr His Ser Leu Arg Asp Leu Asp Ala
195 200 205

Lys Val Gln Ser Gly Tyr Tyr Thr Ala Thr Glu Asn Glu Glu Asp Val
210 215 220

Lys Ser Glu Ile Glu Ala Thr Lys Lys His Met Lys Ala Val Lys Glu
225 230 235 240

Ser Gly Lys Thr Val Asn Asp Tyr Arg Lys Glu Glu Asn Thr Lys Arg
245 250 255

Cys Lys Leu Lys Ala Leu Thr Asn Lys Phe Asn Arg Leu Phe Leu Lys
260 265 270

Ser Val Ile Asp Thr Asp Ser Leu Gln Val Gly Lys Ala Tyr Leu Ile
275 280 285

Gly Gly Arg Asp Met Lys Asn Val His Gly Leu Tyr Thr Gly Thr Thr
290 295 300

Phe Asp Gln Gln His Ala Asn Phe Leu Ile Val Glu Thr Asp Arg Met
305 310 315 320

His Arg Thr Leu Thr Val Ser Ala Glu Gln Leu Phe Ala Glu Glu Arg
325 330 335

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340 345 350

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Glu Ser Lys Leu Phe Pro Arg Lys Leu His Lys Asp Thr Asn Ser Ile
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Leu Arg Glu Asp Leu Val Ser Ala Cys Gln Glu His Ile Glu Ala Leu
 35 40 45

Val Glu Gly Met Ile Ala His Gly Asp Gly Arg Lys Val Ala Glu Leu
 50 55 60

Asp Thr Ser Thr Gln Tyr Tyr Trp His Leu Lys Leu Val Glu Tyr Thr
 65 70 75 80

Pro Ile Pro Gly Arg Thr Gln His Tyr Val Asp Leu Val Asp Gly Thr
 85 90 95

Asn Pro Asp Val Cys Tyr Phe Ser Leu Cys Asp Cys Ser Gly Asp Asn
 100 105 110

Ile Thr Asp Arg Arg Trp Ser Asn Met Val Lys Arg Leu Gln Asn Pro
 115 120 125

Glu Glu Asp Ile Ala Lys Thr Leu Arg Cys Tyr Phe Arg Gln Asp Ala
 130 135 140

Gly Met Pro Ser Trp Ile Glu Tyr Pro Gln
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 20 25 30

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Tyr Tyr Tyr Phe Asn Thr Ala Ile Cys Ile Glu Asn Pro Val Thr Arg
35 40 45

Glu Phe Ala Ile Asp Asp Ser Tyr Gly Ser Leu Ser Thr Asn Gln Asn
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Cys Ala Gln Tyr Arg Gln Tyr Phe Ser Leu Gly Gly Tyr Lys Glu Val
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Ser Leu Glu Glu Ile His Ala Val
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Lys Tyr Glu Gln Cys His Ile Glu Phe Tyr Thr Ala Gln Ser Arg Leu
20 25 30

Phe Gly Thr Glu Ile Met Gly Glu Val Val Lys Thr Ser Leu Gly Thr
35 40 45

Leu Lys Ile Ala His Pro Glu Glu Asp Leu Phe Glu Val Ala Leu Ala
50 55 60

Tyr Leu Ala Ser Lys Lys Asp Ile Leu Thr Ala Gln Glu Arg Lys Asp
65 70 75 80

Val Leu Phe Tyr Ile Gln Asn Asn Leu Cys
85 90

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Ser Thr Leu Ala Glu Val Ala Lys Val Leu Gly Val Ser Arg Val Ser
20 25 30

Lys Lys Asp Val Glu Glu Gly Lys Tyr Asp Val Val Val Glu Glu Ala
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35

40

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Ala Val Ser Leu Ala Asp Thr Glu Glu Val Val Glu Glu Val Val Thr
 50 55 60

Glu Glu Glu Asp Ile Leu Glu Gly Val Glu Val Val Glu Asp Glu Glu
 65 70 75 80

Glu Glu Glu Ala Ala Glu Asp Val Glu Glu Pro Thr Ser Glu Glu Asp
 85 90 95

Ser Glu Asp Glu Trp Glu Glu Gly Tyr Pro Val Ala Thr Glu Val Glu
 100 105 110

Glu Asp Glu Asp Glu Glu Ile Glu Tyr Pro Glu Val Gly Asp Phe Glu
 115 120 125

Asp Glu Lys Ala Ile Lys Lys Tyr Ile Lys Gly Leu Thr Asp Glu Gln
 130 135 140

Leu Gln Ala Trp Cys Glu Leu Glu Gly Ala Glu Trp Val Glu Asn Glu
 145 150 155 160

His Arg Asn Ile Asn Arg Met Arg Met Ala Met Ala Ile Lys Ala Val
 165 170 175

His Phe Pro Glu Leu Ala Lys Lys Pro Ser Ser Lys Lys Lys Ser Lys
 180 185 190

Tyr Ala Glu Tyr Thr Thr Glu Glu Leu Val Glu Met Ala Ile Asp Asn
 195 200 205

Asn Val Glu Val Arg Asp Asp Lys Gly Asn Glu Arg Ile Leu Arg Met
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Tyr Thr Ile Ile Ala Leu Arg Glu Ala Gly Leu Ile Ser
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 Page 7

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Thr Val Thr Asp Ala Val Pro Phe Ile Leu Ala Gly Tyr Lys Asn Val
35 40 45

Ser Tyr Glu Met Asp Asp Ile Val Val Leu Cys Ser Glu Pro Ile Gly
50 55 60

Leu Thr Trp Glu Asp Val Arg Phe Leu Lys Asn His Glu Gly Ser Val
65 70 75 80

Ser Phe Glu Glu Ile Gly Tyr Glu Asp Lys Ala Met Val Tyr His Val
85 90 95

Asp Leu Gly

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Leu Glu Ala Gly Cys Phe Ser Asp Trp Thr Lys Glu Asp Ile Thr Gly
20 25 30

Asp Leu Lys Tyr Leu Lys Lys Gly Ile Ile Glu Glu Ser Ile Glu Leu
35 40 45

Ile Arg Ala Val Asn Gly Leu Thr Tyr Ser Glu Glu Leu His Asp Phe
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Thr Gln Glu Ile Ile Glu Glu Leu Asp Ile Ser Pro Leu
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20 25 30

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Leu Ser Asp Asp His Val Tyr Gly Ile Val Asp Val Asn Glu Glu Gly
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Leu Phe Cys Leu Gly Trp Val Ser Asp Ile Ser Pro Glu Ser Leu Gln
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65 70 75 80

Leu Ser Glu His Gly Gly Ser Ile Ala Ile Arg Val Glu Val
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Val Glu Asp Gln Tyr His Tyr His Thr Phe Asp Ser Met Gln Asn Arg
35 40 45

Thr Ile Phe Val Leu Glu Asn Pro Leu Tyr Pro Asp Val Asp Lys Ile
50 55 60

Pro Glu Lys Val Leu Gly Ile Ala Val Asp Ala Leu Glu Asp Met Leu
65 70 75 80

Asp Asn Val Pro Val Glu Asp Leu Pro Val Thr Glu Glu Gln Gly Asn
85 90 95

Val Lys Arg Phe Thr Thr Lys Leu Ala Ser Ile Val Phe Asp Val Phe
100 105 110

Leu Ile Ile Pro Asp Phe Val Ser Val Thr Ala Lys Glu Glu
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Leu Met Glu Ala Phe Gln Gly Phe Leu Gly Leu Asp Leu Gly Glu Phe
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Thr Phe Lys Val Lys Pro Gly Val Phe Leu Leu Thr Asp Val Lys Ser
35 40 45

Tyr Leu Ile Gly Asp Lys Tyr Asp Asp Ala Phe Asn Ala Leu Ile Asp
50 55 60

Phe Val Leu Arg Asn Asp Arg Asp Ala Val Glu Gly Thr Glu Thr Asp
65 70 75 80

Val Ser Ile Arg Leu Gly Leu Ser Pro Ser Asp Met Val Val Lys Arg
85 90 95

Gln Asp Lys Thr Phe Thr Phe Thr His Gly Asp Leu Glu Phe Glu Val
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His Trp Ile Asn Leu
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20 25 30

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Phe Tyr Lys His Leu Ser Thr Glu Gln Leu Glu Glu Trp Val Glu Leu
35 40 45

Glu Gly Leu Glu Val Lys Asp Thr Asp Ser Asp Ser Ile Tyr Arg Met
50 55 60

Arg Leu Cys Met Ala Ile Leu Tyr Leu Asn Phe Pro Lys Lys Thr Ala
65 70 75 80

Gly Lys Lys Lys Ala Ser Pro Tyr Lys His Ile Ser Leu Glu Glu Leu
85 90 95

Val Gln Met Ala Thr Asp Asn Asp Ile Glu Val Lys His Thr Asp Ser
100 105 110

Asp Lys Ile Leu Arg Met Arg Thr Ile Met Ala Leu Lys Glu Ala Gly
115 120 125

Lys Leu Gly
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20 25 30

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35 40 45

Val Val Asn Tyr Ser Leu Glu Tyr Gly Asn Tyr Gln Trp Ile Phe Gln
50 55 60

Lys Tyr Met Lys Glu Gly Lys Val Thr Val Glu Arg Phe Tyr Arg Asn
65 70 75 80

Ser Leu Asp Ile Pro Lys Glu Ile Leu Thr Asp Glu Ala Leu Ala Phe
85 90 95

Ile Lys Asp Trp Asp Glu Asn Ala Asn Glu Tyr Glu Leu His Ala Gly
100 105 110

SEQUENCE_LISTING.txt

Glu Gly Val Leu Tyr Phe Lys Tyr Glu Gly Glu Glu Lys Gly Tyr Val
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 35 40 45

Ala Glu Thr Ile Ala Asn His Ile Ile Leu Asp Ile Asn Gly Thr Tyr
 50 55 60

Arg Thr Phe Ser Val Asn Asp Ile Val His Cys Ser Leu Glu Lys Val
 65 70 75 80

Ile Thr Leu Glu Gly Asp Val Thr Asn Glu Phe Ile Asp Arg Leu Gln
 85 90 95

Ile Leu Val Asn Lys Glu Val Gln Gly Ser Gln Ser Thr Gln Gln Ser
 100 105 110

Leu Ser Ser Val Phe Glu Ser Thr Leu Glu Lys Tyr Asn Ser Pro Asp
 115 120 125

Asp Phe Ala Asp Tyr Leu Glu Glu Thr Glu Glu Glu Val Asp Tyr Glu
 130 135 140

Asp Tyr Ser Leu Asp Asp Thr Ile Asp Ala Ile Ser Tyr Ala Leu Lys
 145 150 155 160

Thr Gln Glu Pro Val Gln Ala Glu Trp Cys Leu Leu Met Val Asp Val
 165 170 175

SEQUENCE_LISTING.txt

Tyr Thr Gly Thr Leu Thr Glu Val Thr Val Glu Thr Asp Lys Asp Lys
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Val Ser Lys Lys Arg Leu Gly Glu Val Leu
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35 40 45

Leu Asp Lys Val Gln Glu Asp Tyr Pro Leu Asp Asp Met Glu Lys Asp
50 55 60

Tyr Leu Arg Asp Leu Leu Gln Phe Trp Leu Ser Arg Leu Phe Leu Gly
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Ala Ser Lys
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35 40 45

Tyr Asn Val Glu Glu Ile Ser Lys
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20 25 30

Phe Thr Glu Asp Asn Leu Glu Glu Gly Ile Ile Pro Glu Tyr Val Thr
35 40 45

Ala Asn Asp Asp Thr Phe Asp Arg Ile Val Asp Ala Val Glu Phe Gly
50 55 60

Tyr Leu Glu Glu Leu Glu Leu Val
65 70